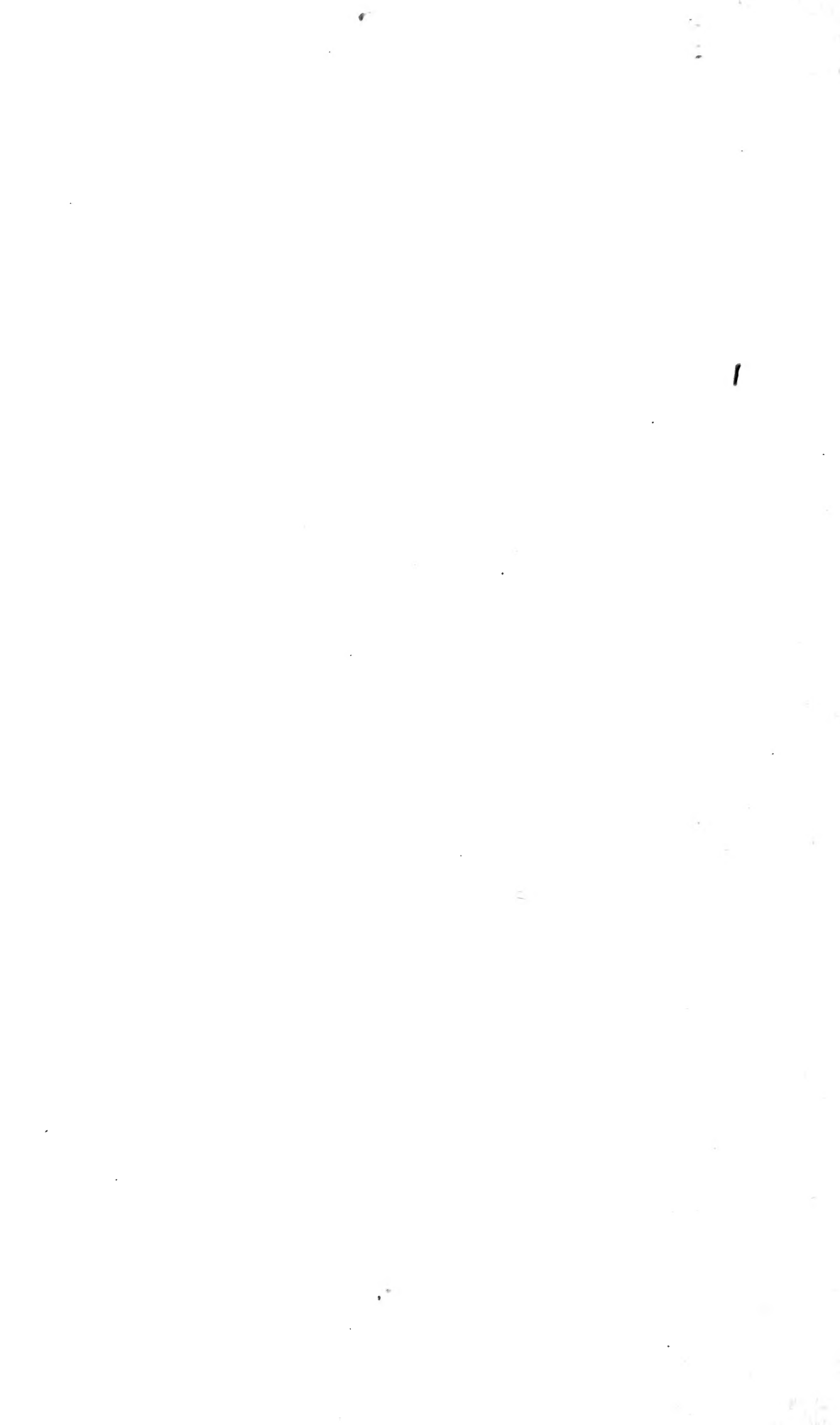


HARVARD UNIVERSITY



Library of the
Museum of
Comparative Zoology



ANNUAL REPORT
OF
THE ASSISTANT IN CHARGE
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE,
TO THE
PRESIDENT AND FELLOWS OF HARVARD COLLEGE
FOR
1899-1900.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1901.

ANNUAL REPORT
OF
THE ASSISTANT IN CHARGE
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE,
TO THE
PRESIDENT AND FELLOWS OF HARVARD COLLEGE
FOR
1899-1900.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1901.

LIBRARY
MUS. COMP. ZOO
CAMBRIDGE, MA

MUSEUM OF COMPARATIVE ZOÖLOGY.

Faculty.

CHARLES W. ELIOT, *President.*

HENRY P. WALCOTT.

GEORGE L. GOODALE.

———, *Curator.*

ALEXANDER AGASSIZ, *Secretary.*

Committee on the Museum.

HENRY P. WALCOTT.

GEORGE L. GOODALE.

Officers.

W. McM. WOODWORTH . . . *Keeper of the Museum.*

WALTER FAXON *Assistant in Charge of Crustacea and Mollusca.*

SAMUEL GARMAN *Assistant in Herpetology and Ichthyology.*

WILLIAM BREWSTER *Assistant in Ornithology.*

ALPHEUS HYATT *Assistant in Invertebrate Palæontology.*

SAMUEL HENSHAW *Assistant in Entomology and Librarian.*

C. R. EASTMAN *Assistant in Vertebrate Palæontology.*

OUTRAM BANGS *Assistant in Mammalogy.*

FRANCES M. SLACK *Librarian Emerita.*

MAGNUS WESTERGREN . . . *Artist.*

NATHANIEL S. SHALER . . . *Professor of Geology.*

WILLIAM M. DAVIS *Sturgis-Hooper Professor of Geology.*

EDWARD L. MARK *Hersey Professor of Anatomy.*

ROBERT T. JACKSON *Assistant Professor of Palæontology.*

GEORGE H. PARKER *Assistant Professor of Zoölogy.*

ROBERT DEC. WARD *Assistant Professor of Climatology.*

Instructors and Assistants in the Laboratories of Zoölogy and Geology.

JAY B. WOODWORTH *Instructor in Geology.*

REGINALD A. DALY *Instructor in Physiography.*

THOMAS A. JAGGAR, JR. . . . *Instructor in Geology.*

WILLIAM E. CASTLE *Instructor in Zoölogy.*

HERBERT W. RAND *Instructor in Zoölogy.*

JOSEPH E. WOODMAN *Assistant in Geology.*

HOWARD CRAWLEY *Assistant in Zoölogy.*

ROBERT S. BREED *Assistant in Zoölogy.*

THOMAS ORDWAY *Assistant in Zoölogy.*

RALPH W. STONE *Assistant in Geology.*

HENRY C. BOYNTON *Assistant and Austin Teaching Fellow in
Geology.*

REPORT.

TO THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE:—

DURING the past academic year the regular courses in Zoölogy and Geology were given in the Natural History Laboratories of the Museum. Eight courses in Zoölogy were given by Professors Mark, Jackson, Parker, and Dr. Castle, assisted by Messrs. Breed, Crawley, and Ordway. These courses were attended by two hundred and seventy-six students. Six courses in Zoölogy were given to forty-two students of Radcliffe College.

Thirteen courses under the Department of Geology were given by Professors Shaler, Davis, Jackson, Ward, Drs. Jaggar and Daly, and Mr. J. B. Woodworth, assisted by Messrs. Boutwell and Burr. These courses were attended by five hundred and twenty-eight students. Eight courses in Geology were given to thirty-six students of Radcliffe.

The Summer School of Geology, which is held in the Museum, offered four courses, in which seventy-eight students were enrolled. The school was conducted by Professor Davis and Messrs. J. B. Woodworth and Woodman, assisted by Mr. Burr.

A noticeable thing in the reports of the Natural History Laboratories is the large number of students in these departments that have been called to positions in other colleges and universities or have been connected with the national and State geological surveys. The activity of the laboratories is also expressed by the number and quality of the publications by students in them. During the past year fifteen contributions from the Zoölogical Laboratory have been published, five of which appeared in the Bulletin of the Museum.

Chief among the changes and repairs have been the introduction of water into the extreme eastern end of the building in the rooms assigned to the assistants in Entomology and Verte-

brate Palæontology. The many additions to the collections of birds have made necessary a rearrangement of the storage cases in the rooms on the fifth floor so as to provide separate rooms for the storage of bird and mammal skins. The delivery room of the library has undergone extensive alterations, including additional stacks for the increasing collection of books of reference. By these changes and many minor ones, much has been done for the comfort and efficiency of service of the staff of the Museum.

The changes in the exhibition rooms have been few. The arrival of a mounted specimen of the Eland has necessitated a new arrangement of the animals in the African room, which is now nearly as complete in the larger forms as space will allow. A large case has been constructed in the Europeo-Siberian room to accommodate a fine male Yak also purchased during the past year, and a large specimen of the European Brown Bear has been added to the faunal collections of this room.

In the Report of last year mention was made of the great need of the Museum for a collection of skins of mammals for study and reference. Thanks to the efforts of the Overseers Committee, friends of the Museum have purchased for it the well-known collection of E. A. and O. Bangs of Boston,—one of the best and most complete collections of North American mammals, comprising over ten thousand skins, mostly with skulls, including upwards of one hundred type specimens, all in perfect order and condition. Considering the large outlay, and the years of labor expended on the collection, and the nominal sum for which its owners released it, the collection comes to the Museum rather as a gift from the Messrs. Bangs. Mr. Outram Bangs has been appointed assistant in Mammalogy and assumes charge of the Museum collections.

In the Department of Ornithology the principal accessions were a series of Arizona skins from Mr. J. F. McClure of New York and the large Bryant collection deposited by Mr. Henry Bryant Bigelow of Boston, details of which will be found in Mr. Brewster's report.

Although no very important additions have been received to the collections of Insects, Fishes, and Reptiles, it is gratifying to see by the reports of Mr. Henshaw and Mr. Garman that the number of contributors to these departments has been greater than in recent years.

Dr. Faxon, who was away from Cambridge on leave of absence for half of the year, reports good progress in the arrangement of the Call collection of Unionidæ and welcome additions to the collections of Mollusca and Crustacea.

The assistant in charge of Radiates, Dr. A. G. Mayer, has resigned from the Museum staff to accept an appointment in the Museum of the Brooklyn Institute.

The collection of Worms has received a valuable addition from Professor Ludwig von Graff in a long series of specimens of Land-planarians, co-types of many of the forms described by him in his monograph of the group. To Dr. Sateiro Goto of Japan the collection is also indebted for a series of Trematod types. Owing to the accumulation of material gathered by Mr. Agassiz's expeditions in the Pacific, the task of studying the large collection of Nemerteans in the Museum with those of the U. S. National Museum and the Columbia University Puget Sound Expedition, has had to be abandoned by the assistant in charge, and Dr. Wesley R. Coe of Yale University has undertaken to carry on the work, limited to forms from the Pacific Coast. Since his return to Cambridge he has made good progress with his study of the Palolo or Bololo worm of Samoa and Fiji and allied Eunicidæ from the tropical Pacific, and will soon have ready his report on the Nemerteans of the "Albatross" expedition of 1891.

The palæontological collections have been enriched by two specimens of great value in the purchase of complete skeletons of a gallinaceous bird and an alligator gar of large size, both of Tertiary age. These unique specimens have been described in the Bulletin of the Museum by Dr. Eastman and Mr. F. A. Lucas. Dr. Eastman, in the interests of his department, is visiting the fossil fields of the West, and his travels promise to add largely to our collection of fossil vertebrates.

From Joseph Willcox, of Philadelphia, there has been received a valuable collection of Eocene shells from the "Isaac Lea Collection" in the Philadelphia Academy of Sciences. This gift comes as a contribution from a descendant of Gov. Thomas Dudley, who signed the charter of Harvard College in 1650.

To the Cuban teachers, who were entertained by the University during the past summer, we are indebted for several small miscellaneous collections.

Under the direction of Mr. Henshaw the library is undergoing a thorough overhauling with a view to filling gaps in the serials. The geological serials which were divided between the Whitney and General Museum libraries have been combined, as well as the reports of government surveys, and have been alphabetically arranged according to countries. The library has received about the usual number of accessions.

The publications of the Museum during the past year have been more than the average number. Fourteen numbers of the "Bulletin" have appeared, with 683 pages and 174 plates, and two numbers of the "Memoirs" with 574 pages and 121 plates. One report on the explorations of the "Blake" (No. XXXVIII.), that of Professors Bouvier and Fischer (Bull., Vol. XXXII., No. 10), has appeared, and two reports (Nos. XXV. and XXVI.) on the results of the "Albatross" expedition of 1891, that on the Ophiuridæ by Professor Lütken and Dr. Mortensen (Mem., Vol. XXIII., No. 2), and Mr. Garman's splendid report on the Fishes (Mem., Vol. XXIV.). Six numbers of the "Bulletin" represent Contributions from the Zoölogical Laboratory under the direction of Dr. Mark, and one from Mr. Agassiz's Marine Laboratory at Newport. Volumes XXXVI., XXXVII., and XXXVIII. of the "Bulletin" and Volumes XXV. and XXVI. of the "Memoirs" are in course of publication.

The crowded condition of the Natural History Laboratories incident upon the increasing number of students has for some time past hampered the departments of Zoölogy, Geology, and Geography, and hindered their growth and development. Through the generosity of Mr. Agassiz, Mr. and Mrs. Quincy A. Shaw, and Mrs. Henry L. Higginson, the southwest corner of the University Museum is soon to be built, and this addition will complete the main or eastern façade of the great building planned by the late Professor Agassiz and leave unfinished but one hundred feet of the southern wing to realize the entire plan. The new building will accommodate the departments of Geology and Geography, providing them with numerous lecture rooms, laboratories, and shops, and three exhibition rooms, which will connect through the mineralogical museum with the system of exhibition rooms of the entire building. The laboratories and lecture rooms now occupied

by the departments of Geology and Geography will be assigned to the departments of Zoölogy and Palæontology.

During the greater part of the year the assistant in charge was absent from Cambridge with Mr. Agassiz on the cruise of the "Albatross" in the tropical Pacific. The United States Fish Commission steamer "Albatross" was placed at the disposal of Mr. Agassiz to explore the islands of the tropical Pacific in continuance of his researches on coral formations. There accompanied him from the Museum, as assistants, Drs. A. G. Mayer and W. McM. Woodworth. The government naturalists attached to the ship were Dr. H. F. Moor and Mr. A. B. Alexander, and Mr. C. H. Townsend, who remained with the expedition as far as Fiji. The "Albatross" was commanded by Commander Jefferson F. Moser, U. S. N., with Lieut. Hugh Rodman as executive officer, and to the untiring interest of these two gentlemen and the officers of the "Albatross" is due much of the success of the expedition. The Hon. George M. Bowers, United States Commissioner of Fish and Fisheries and the Navy Department at Washington, did everything possible to advance the interests of the expedition. The expedition was assisted in every way by the officials of the different governments in the Pacific, and was received with the greatest courtesy and cordiality in the English, French, and German colonies, and by the Japanese government.

The "Albatross" sailed from San Francisco on August the twenty-third, 1899, and arrived at Yokohama on March the fourth of the following year, after having visited more than seventy-five different islands in the Marquesas, Paumotus, Society, Cook, Friendly, Fiji, Ellice, Gilbert, Marshall, Caroline, and Ladrone groups. Two hundred and forty-nine different hydrographic stations were occupied. By far the deepest trawl haul yet made was successfully accomplished in 4,173 fathoms, with the "Blake" beam trawl, about seventy-five miles east of Togatabu, when large fragments of a silicious sponge were brought up in the trawl. Extensive collections were made with intermediate and surface nets, and shore collections of all kinds. A number of hauls were made with the Krämer quantitative nets to determine the relative amount of pelagic life within and outside of atolls, and showed the presence of a richer plankton in the atoll lagoons. More than one thousand photographic negatives were obtained illustrating

the physical characteristics of the different islands and reefs visited. The large collections are being sorted and distributed to different specialists to report upon, and the results will be published by the Fish Commission in co-operation with Mr. Agassiz for the Museum. Several reports are nearly ready for the printer.

The assistant in charge is under great obligations to Mr. Samuel Henshaw, who took entire charge of the Museum during his long absence in the Pacific.

W. McM. WOODWORTH,
Assistant in Charge.

REPORT ON THE ZOÖLOGICAL LABORATORY.

BY PROFESSOR E. L. MARK.

As no formal report since that for the year 1897-98 has been printed, the present report will cover the academic years 1898-99 and 1899-1900.

Owing to the absence of Professor Mark in Europe during the year 1898-99, the work of the Department was to some extent rearranged. Course 2 was given jointly by Doctors Parker and Castle. Dr. Castle took charge of courses 4 and 5, and the duty of supervising research students was shared by Doctors Davenport, Parker, and Castle.

The numbers of students from the several classes in the various courses of the Department are shown as usual in the following table, to which is added for convenience of reference the number of students in the corresponding courses given in Radcliffe College.

Courses, 1898-99.	Grad.	Sen.	Jun.	Soph.	Fresh.	Spec.	Sci.	Total
Zoölogy 1	1	7 4	22 5	30 2	23 3	6 5	33	122 19
" 2		4 2	6 2	7 2	1	2 4	13	33 10
" 3	6 1	6 2	6 2	2		1	14	34 6
" 4	2 1	4 1	1			1	5	12 3
" 5	3	2	1				4	10
" 9	2						1	3
" 11	9						1	10
" 16	7	2	1				4	12 2
" 20 a	12						3	15
Totals . .	42 2	23 11	37 9	39 4	24 3	8 11	78	251 40

The numbers in italic refer to students of Radcliffe College.

Zoölogy 1 was given, as previously, by Dr. Davenport. The Chief Assistant in the course was Mr. S. R. Williams; the Sub-Assistants were Messrs. J. W. Folsom and R. M. Yerkes.

The lectures in Zoölogy 2 were given by Doctors Parker and Castle, Dr. Parker giving the introductory lectures and those on

Coelenterates, Crustacea and Vertebrates, and Dr. Castle those on Protozoa, Sponges, Worms, Echinoderms, Insects, and Molluscs. The laboratory work was supervised by Dr. Parker, who had as Chief Assistant Mr. C. W. Prentiss and as Sub-Assistant Mr. R. M. Yerkes.

Dr. Parker conducted the work in Anatomy of Vertebrates (Zoölogy 3) on the same plan as in the preceding year and had as Assistant Mr. P. Frandsen. Six students were allowed to put the last six weeks of their work in the course on different selected topics in comparative anatomy.

The course on Microscopical Anatomy (Zoölogy 4) and that on Embryology of Vertebrates (Zoölogy 5) were given by Dr. Castle, who had assisted in these courses in the previous years. Mr. H. W. Rand had charge of the laboratory work in both these courses. The ground covered by the lectures in Zoölogy 4 was substantially the same as in previous years and the laboratory work was on the same animal, *Clepsine*. In Zoölogy 5 the laboratory work was on the embryology of the chick. In the lectures less attention than usual was given to special questions, more to the general outlines of development.

Dr. Jackson, who was promoted during the year to be Assistant Professor of Palæontology, carried on Zoölogy 9. Sets of models of Brachiopods and of Trilobites were purchased by the Department to facilitate the instruction on these groups.

In Zoölogy 11, given by Dr. Davenport, the number of students was larger than ever before, and from the nature of the work entailed a corresponding increase of labor on the part of the instructor. The results of the work of some of the students in this course — Messrs. P. Frandsen, R. M. Strong, and R. M. Yerkes — have been prepared for publication and will appear in the Contributions from this laboratory. That of Mr. H. W. Rand has already been published as No. 102 of the Contributions.

The lectures in Zoölogy 16 by Dr. Parker were followed chiefly by Graduates and Scientific School students. A report was required from each student on some topic selected for reading.

So much of Dr. Davenport's time had to be given to the work of students in Zoölogy 11, that he took charge of only the three following students carrying on researches in Zoölogy 20a: Mr. J. W. Folsom prepared a paper on "The Development of the Mouth-Parts in *Anurida maritima* Guér.;" Mr. W. J. Moenkhaus worked

on a problem in variation till the middle of the year, when he accepted a temporary position in Williams College caused by the death of Professor Peck; Mr. W. L. Tower studied variation in the color-pattern of the wings of certain beetles.

Dr. Parker supervised the work of the following men in Zoölogy 20a: Mr. C. W. Prentiss continued his studies on the otocyst of decapod Crustacea, and Mr. S. R. Williams his on the changes accompanying the migration of the eye in flounders; Mr. F. Howe, Jr. investigated the early condition of the nervous system in the spider and the lobster; Mr. P. Frandsen began work on planarians; Mr. R. M. Yerkes began the study of the pineal eye of a reptile; Mr. P. E. Sargent continued his researches on the central nervous system of teleosts, arriving at some interesting results, which have been published as No. 106 of the Contributions; Mr. W. A. Hickman continued work on the mesenteries of Amphibia. The studies of Mr. W. A. Willard on the eyes of Pecten were supervised by Doctors Parker and Castle jointly.

Dr. Castle had entire charge of the following men in their researches: Mr. H. W. Rand continued his studies on the centrosomes of nerve cells in the earthworm, and Mr. R. W. Hall on the mesonephros in Amphibia; Mr. M. A. Bigelow nearly completed a valuable paper on the development of Lepas; and Mr. J. C. Phillips studied the development of the ear in Amblystoma.

In June, 1899, the degree of Doctor of Science was conferred upon one candidate in zoölogy, Mr. Justus Watson Folsom. His thesis consisted of two parts: I. The Anatomy and Physiology of the Mouth-Parts of the Collembolan, *Orchesella cincta* L.; II. The Development of the Mouth-Parts of *Anurida maritima* Guér. Dr. Folsom was appointed at the close of the year to the Chair of Biology in Antioch College. The degree of A.M. was conferred upon five students whose work had been chiefly zoölogical, and that of S.M. upon one.

Professor Jackson published a paper on development of animals and plants, the title of which will be found in the Report on Geology. Dr. Davenport published during the year "Experimental Morphology, Part Second. Effect of Chemical and Physical Agents upon Growth," — "The Fauna and Flora about Cold Spring Harbor, L. I.," — "Statistical Methods with Special Reference to Biological Variation," and articles in *The American Naturalist*. He continued to be Director of the Biological Laboratory of the

Brooklyn Institute at Cold Spring Harbor, L. I., N. Y., to the supervision of which he gave a considerable part of the summer vacation. Dr. Parker published in the Museum Bulletin an article which appears as No. 100 of the Contributions and jointly with a student of Radcliffe College another which constitutes No. 101 of the same series. A brief account of *Branchiocerianthus* was presented to one of the Sections of the Fourth International Congress of Zoölogy, at Cambridge, England, by Professor Mark, and is printed in the Proceedings of the Congress; and a note, entitled “‘*Branchiocerianthus*,’ a Correction,” was later published in the *Zoologischer Anzeiger*. While the general supervision of the Contributions remained with Professor Mark, much of the burden of looking after details connected with the reproduction of plates, etc., was borne by Dr. Parker. A list of the Contributions published since July, 1898, is appended to these reports.

The Virginia Barret Gibbs Scholarship was held by Mr. Maurice A. Bigelow, who received at the end of the year an appointment in the Teachers' College, Columbia University. One of the Parker Fellowships was granted by the Corporation to Dr. F. W. Bancroft, who studied at the University of Berlin and at the Naples Zoölogical Station.

During the summer of 1899 nine persons received aid from the income of the Humboldt Fund while carrying on studies at the U. S. Fish Commission Laboratory, Wood's Hole.

The meetings of the Zoölogical Club were held, as in 1897-98, at 4.30 P.M. on Thursday, and were well attended.

Toward the close of the year 1897-98 plans were made for replacing the temporary wooden supports of the paraffine water-baths used in the laboratories by more permanent shelves made of slate and supported by iron brackets. This improvement was carried out in the summer of 1898. To decrease further the risk from fire a large slab of thick slate-stone was also placed on the floor beneath each water bath. Although this was an expensive improvement, it was highly important, and the change has incidentally resulted in making the laboratory equipment more convenient.

At the beginning of the College year 1899-1900 the Department met with a serious loss by the resignation of Dr. C. B. Davenport, whose thorough knowledge and untiring energy were

of great value to the Department, and whose enthusiasm and sympathetic guidance were especially appreciated by those advanced students who knew him intimately. His sudden departure made it necessary to withdraw Course 10 and rearrange to some extent the other courses.

Dr. Parker, who was promoted to be Assistant Professor of Zoölogy, took charge of Course 1, in addition to Course 15, and gave up Course 3. Dr. Castle resumed his position in charge of Zoölogy 2 and as Assistant in Courses 4 and 5, and Professor Mark resumed the work he had before taking his "Sabbatical year." Mr. W. B. Cannon was appointed Instructor in Zoölogy for the year and conducted Course 3.

The following Table gives the number of students from the various classes in each of the zoölogical courses, and like information about students attending corresponding courses in Radcliffe College. The total number of students in all zoölogical courses in Harvard exceeded that of the previous year by about 10 per cent.

Courses, 1899-1900.	Law	Grad.	Sen.	Jun.	Soph.	Fresh.	Spec.	Sci.	Total
Zoölogy 1	1	2	21 <i>9</i>	17 <i>6</i>	28 <i>2</i>	30 <i>2</i>	6 <i>2</i>	42	146 <i>21</i>
" 2		2	2 <i>2</i>	9 <i>4</i>	11	2 <i>1</i>	1 <i>2</i>	20	47 <i>9</i>
" 3		2	6 <i>1</i>	3 <i>1</i>	1		2 <i>2</i>	4	17 <i>5</i>
" 4		3 <i>1</i>	4	1				7	15 <i>1</i>
" 5		2	4	1				6	13
" 9			1					1	2
" 15		4	7	4 <i>2</i>			1 <i>2</i>	7	23 <i>4</i>
" 20 <i>a</i>		12 <i>2</i>	1						13 <i>2</i>
Totals . .	1	27 <i>3</i>	46 <i>12</i>	35 <i>13</i>	39 <i>3</i>	32 <i>3</i>	10 <i>8</i>	87	276 <i>42</i>

The numbers in italic refer to students of Radcliffe College.

No material change was made in the time devoted to the various subjects treated of in the lectures in Zoölogy 1, and the laboratory work was also conducted in the same manner as in previous years. Owing to the size of the class it has for some years been necessary to have three men sit at each table. The microscope boxes have been in the way, if left on the work table during laboratory hours; relief from the annoyance has been got by providing each chair with a shelf under the seat, where the microscope is kept when not in use and where the box is put while the microscope is in use. Professor Parker had as Chief Assistant in this course Mr. S. R. Williams, who had held the

same position the year before, and as Sub-Assistant Mr. W. L. Tower.

In Zoölogy 2 Dr. Castle gave the lectures and supervised the laboratory work. His Chief Assistant was Mr. C. W. Prentiss, who had been Assistant in the course during the previous year; the Sub-Assistant was Mr. W. A. Willard.

Mr. W. B. Cannon conducted the work in Zoölogy 3 on the same general plan that has been followed for several years. Special topics in comparative anatomy were substituted for class work during the last five weeks in the case of nine students, who had done their routine work in a manner to warrant this substitution. Mr. W. A. Willard was Assistant in the course.

Zoölogy 4 and 5 were carried on substantially as in 1897-98.

In addition to those regularly enrolled, Professor Jackson has had, as more or less regular attendants on his lectures in Zoölogy 9, five students, mostly graduates. He proposes in future to divide the course into two half courses, giving in the first half year a more rapid survey of fossil invertebrates than heretofore, and in the second half year more advanced work on selected groups. It is hoped that the reduction of the time required for the general survey will render it possible for a larger number of the zoölogical students to take this important course.

Zoölogy 15 was given by Professor Parker in the second half year; not in the first as announced. The lectures were attended regularly by one Instructor and one senior, in addition to those enrolled, and by three other students irregularly. Although proper laboratory facilities could not be provided for this course, it was decided to allow a certain number of men to substitute laboratory work for the thesis required of other members of the class. Eight students availed themselves of this opportunity to work on special topics. The results obtained by three or four of them will be presented for publication. In future the opportunity for laboratory work will be offered to a limited number of the students electing this course or Zoölogy 16. Professor Parker also proposes to transfer permanently Courses 15 and 16 to the second half year, and to offer next year a half course in the first half year, to be called Zoölogy 13, dealing with the structure and genesis of the chief animal tissues, and giving special attention to the structure and functions of the nervous elements in relation to other tissue elements.

Of the students engaged in special researches (Zoölogy 20a) three completed their work and presented theses which were accepted for the Doctorate in Zoölogy.

Of the others, Mr. P. E. Sargent continued his studies on teleosts; Mr. R. M. Strong gave considerable time to the completion of a paper on the varieties of the southern shrike, and began the study of color in feathers; Mr. P. Frandsen pursued work on the nervous system of certain flat-worms, reaching interesting results; Mr. F. Howe, Jr., continued his investigation of the nervous system of the lobster; Mr. W. A. Willard began the study of the cranial nerves of one of the reptiles; Mr. W. L. Tower studied the development of the wings in a group of insects; Mr. R. S. Breed began a comparative problem in the metamorphosis of insects; Mr. H. Crawley carried on investigations to ascertain the nature of the absorption of fat in Amphibia; Mr. J. M. Johnson gave some time to a study of the nervous system of Entomostraca; and Mr. R. M. Yerkes carried on some experiments to ascertain the nature of the reaction of certain Entomostraca to light.

The degree of Doctor of Philosophy was conferred upon three candidates in Zoölogy in June, 1900: Mr. Herbert Wilbur Rand, whose thesis was "A Study upon the Regenerating Nervous System of *Lumbricus*, with Special Regard to the Centrosome of Nerve Cells." Dr. Rand has been appointed Instructor in Zoölogy in this Department for the year 1900-1901; Mr. Charles William Prentiss, whose thesis was on "The Otocyst of Decapod Crustacea; its Structure, Development, and Physiology." Dr. Prentiss has been appointed Instructor in Comparative Anatomy in the School of Veterinary Medicine of Harvard University; Mr. Stephen Riggs Williams, whose thesis was on "Changes Incident to the Migration of the Eye in *Pseudopleuronectes americanus*, together with Some Observations on the Optic Tract and Tectum Opticum." Dr. Williams has been appointed to the Chair of Biology in Miami University. Mr. Peter Frandsen, whose thesis has not yet been completed, has accepted an appointment to the Chair of Biology in the University of Nevada, and Mr. W. L. Tower a like position in Antioch College.

In December, 1899, Dr. F. W. Bancroft resigned his Parker Fellowship and relinquished the stipend for the year to accept a position in the Zoölogical Department of the University of California.

The Virginia Barret Gibbs Scholarship was held by Mr. H. W. Rand. Eight students working at the U. S. Fish Commission Laboratory, Wood's Hole, in the summer of 1900, received aid from the income of the Humboldt Fund.

The meetings of the Zoölogical Club were held weekly during the greater part of the year on Thursday afternoons from 4.30 to 6 o'clock, and were attended by from 15 to 20 persons.

Professor Parker has published in the Contributions Nos. 100 and 110, and jointly with a student of Radcliffe College No. 101. He has also published "Studies from the Newport Laboratory, No. 42," in the Museum Bulletin; a lecture on "The Neurone Theory in the Light of Recent Discoveries," in *The American Naturalist*, June, 1900; and reviews for *Science* and *The American Naturalist*. Dr. Castle has published in the Contributions two important papers, Nos. 108 and 112, on Hirudinea, and reviews in *The American Naturalist*.

The need of better lighting for the work tables of the laboratories has long been evident; the want of good light is especially felt during the short days of autumn and early winter. Soon after the beginning of the year, the large lecture room on the fifth floor, which is also used as a laboratory for students in Zoölogy 1, was furnished with electric lamps and shades pendant from movable brackets and adjustable to any desired height, one over each table. The arrangement has proved to be highly satisfactory. Clusters of electric lamps for the general lighting of the laboratory on the second floor were also introduced. Through the courtesy of the Department of Mineralogy and Petrography these lamps were lighted from the dynamo belonging to that department. In addition, the work tables in three of the laboratories that were already conveniently supplied with gas piping were fitted out each with a single Welsbach burner and shade. The piping of the table is permanently attached to the under side of the top, and is easily connected with the wall piping by means of short rubber tubing. This arrangement will allow the use of such tables in any other room without further outlay, should it be found necessary in the future to shift a laboratory from one room to another.

*Contributions from the Zoölogical Laboratory for the Academic Years
1898-99 and 1899-1900.*

- XCIII. MARK, E. L. — Preliminary Report on Branchiocerianthus urceolus, A new type of Actinian. Bull. Mus. Comp. Zoöl., Vol. 32, No. 8, pp. 147-154. 3 pls. August, 1898.
- XCIV. SARGENT, P. E. — The Giant Ganglion Cells in the Spinal Cord of Ctenolabrus coeruleus. Anat. Anzeiger, Bd. 15, No. 11 u. 12, pp. 212-225. 10 figs. December 20, 1898.
- XCV. RAND, H. W. — Regeneration and Regulation in Hydra viridis. Archiv für Entwicklungsmechanik, Bd. 8, Heft 1, pp. 1-34, Taf. 1-4. February 21, 1899.
- XCVI. FOLSOM, J. W. — The Anatomy and Physiology of the Mouth-Parts of the Collembolan, Orchesella cincta L. Bull. Mus. Comp. Zoöl., Vol. 35, No. 2, pp. 5-39. 4 pls. July, 1899.
- XCVII. MARK, E. L. — "Branchiocerianthus," a Correction. Zool. Anzeiger, Bd. 22, No. 590, pp. 274, 275. June 26, 1899.
- XCVIII. BANCROFT, F. W. — Oogenesis in Distaplia occidentalis Ritter (MS.), with Remarks on Other Species. Bull. Mus. Comp. Zoöl., Vol. 35, No. 4, pp. 57-112. 6 pls. October, 1899.
- XCIX. GALLOWAY, T. W. — Observations on Non-sexual Reproduction in Dero vaga. Bull. Mus. Comp. Zoöl., Vol. 35, No. 5, pp. 113-140. 5 pls. October, 1899.
- C. PARKER, G. H. — The Photomechanical Changes in the Retinal Pigment of Gammarus. Bull. Mus. Comp. Zoöl., Vol. 35, No. 6, pp. 141-148. 1 pl. October, 1899.
101. PARKER, G. H., AND DAVIS, FREDERICA K. — The Blood Vessels of the Heart in Carcharias, Raja, and Amia. Proceed. Bost. Soc. Nat. Hist., Vol. 29, No. 8, pp. 163-178. 3 pls. October, 1899.
102. RAND, H. W. — The Regulation of Graft Abnormalities in Hydra. Archiv für Entwicklungsmechanik, Bd. 9, Heft 2, pp. 161-214. pls. 5-7. October, 1899.
103. YERKES, R. M. — Reaction of Entomostraca to Stimulation by Light. Amer. Jour. Physiol., Vol. 3, No. 4, pp. 157-182. November, 1899.
104. TOWER, W. L. — The Nervous System of the Cestode Moniezia expansa. Zool. Jahrb., Abth. für Anat., Bd. 13, Heft 3, pp. 359-384. pls. 21-26. April 10, 1900.
105. WAITE, F. C. — The Structure and Development of the Antennal Glands in Homarus americanus Milne-Edwards. Bull. Mus. Comp. Zoöl., Vol. 35, No. 7, pp. 149-210. 6 pls. December, 1899.

106. SARGENT, P. E. — Reissner's Fibre in the Canalis Centralis of Vertebrates. *Anat. Anzeiger*, Bd. 17, Heft 2, pp. 33-44. 3 pls. January 15, 1900.
107. WILLIAMS, S. R. — The Specific Gravity of Some Fresh-Water Animals in Relation to their Habits, Development, and Composition. *Amer. Naturalist*, Vol. 34, No. 398, pp. 95-108. 3 figs. February, 1900.
108. CASTLE, W. E. — The Metamerism of the Hirudinea. *Proceed. Amer. Acad. Arts and Sciences*, Vol. 35, No. 15, pp. 283-303. 8 figs. February, 1900.
109. LINVILLE, H. R. — Maturation and Fertilization in Pulmonate Gasteropods. *Bull. Mus. Comp. Zoöl.*, Vol. 35, No. 8, pp. 211-248. 4 pls. May, 1900.
110. PARKER, G. H. — Note on the Blood Vessels of the Heart in the Sunfish (*Orthogoriscus mola* Linn.). *Anat. Anzeiger*, Bd. 17, Heft 16 u. 17, pp. 313-316. 1 fig. March 31, 1900.
111. PRATT, H. S. — The Embryonic History of Imaginal Discs in *Melophagus ovinus* L., etc. *Proceed. Bost. Soc. Nat. Hist.*, Vol. 29, No. 13, pp. 241-272. 7 pls. June, 1900.
112. CASTLE, W. E. — Some North American Fresh-Water Rhynchobdellidæ, and their Parasites. *Bull. Mus. Comp. Zoöl.*, Vol. 36, No. 2, pp. 15-64. 8 pls. August, 1900.

REPORT ON THE LABORATORIES OF GEOLOGY AND GEOGRAPHY.

BY PROFESSORS SHALER, DAVIS, JACKSON, AND WARD.

As no Report has been made to the Faculty of the Museum since the year 1897-98, the following Report covers the work for the years 1898-99 and 1899-1900. The table shows the number of students enrolled in the courses given in the Museum for the two academic years covered by this report. Professor Shaler's elementary course (Geol. 4) is not included in the table: no lecture room in the Museum being large enough to accommodate the many students (over 400) enrolled in the course, the lectures are held in Sanders Theatre.

During the year 1898-99 five courses were given to students of Radcliffe College, attended by 52 students; and during the year 1899-1900 eight courses were attended by 36 students of Radcliffe.

Courses.	Students.	
	1898-99.	1899-1900.
Geology A	104	94
" B	123	84
" 5	129	139
" 7	23	(omitted.)
" 8	17	24
" 9	13	(omitted.)
" 11	6	36
" 14	30	49
" 15	3	3
" 16	5	24
" 19	19	18
" 20	2	(omitted.)
" 22	9	6
" 23	6	6
" 24	1	2
" 25	19	18
Totals .	519	549

Professor Shaler has given or taken part in ten courses during each of the past two years. These courses were attended by a total of 488 students in 1898-99. Other courses of a geological nature were given by Mr. Woodworth and Dr. Jaggar. Mr. Woodworth was placed in general charge of the courses in geological field work for the year 1898-99. Fifteen students were enrolled in these courses under various instructors,

including Professors Shaler and Smyth, Dr. Jaggar and Mr. Woodworth. Messrs. Burr and Burke made a careful study of

the Boston Basin, with the result that fossils were found by them in the sandstones of the Roxbury conglomerate in Mt. Hope Cemetery. One student did office-work during the winter in completing field studies performed during the summer, under the direction of Mr. Woodman, in Nova Scotia.

In 1898-99 Mr. L. La Forge made a critical examination, under Mr. Woodworth's supervision, of the bibliography of the boundary between the Devonian and Carbonic systems of New York and Pennsylvania in continuation of the field studies previously carried on by him in the region about Olean, N. Y. It is expected that this work, with field studies connected therewith, will be completed for publication. Mr. La Forge also made a special study, under Dr. Jaggar's direction, of the eruptive rocks associated with the Cambridge slate. In the experimental laboratory Mr. Howe completed an experimental research on igneous intrusion, and his thesis has been accepted for publication by the U. S. Geological Survey, as a chapter in a paper on "The Laccoliths of the Black Hills," by T. A. Jaggar, to be published in the 21st Annual Report of the Director of the Survey. In the spring of 1899 a half-course of lectures on the Geology of the United States was given for the first time by Dr. Jaggar, with an attendance of thirteen chiefly advanced students.

In 1899-1900, the course in advanced field work (Geol. 22), formerly divided among several instructors, was placed under Dr. Jaggar's sole charge. The students now make permanent collections and notes according to a uniform system, and these records are preserved in the laboratory with a view to eventual publication of a geologic map of the region about Boston. Each student surveys an area in the fall, and presents a mid-year report, map, and sections; in the spring he investigates a field and library topic, so that the year's work yields both areal and topical treatment of field problems. The Metropolitan Park Commission of Boston has rendered valuable assistance by furnishing maps and permits to the students carrying on this survey in the reservations under their control.

Mr. Howe continued his experimental studies in the winter of 1899-1900, perfecting apparatus for the study of Erosion and Drainage. Mr. H. T. Burr finished a field study of the Brighton melaphyr, which has been accepted for publication in the Bulletin of the Museum. Mr. La Forge completed studies of the structure

of the Cambridge slate and adjacent rocks. The class in Geology 22 made a reconnaissance survey of 60 square miles between Waltham and Melrose.

Two geological models have been added to the collections,—one of Crater Lake, Oregon, and one of St. Mary's Butte, California. A few rock specimens have been purchased to fill out the labelled series, and to add to the unlabelled series for individual study. Advantage was taken, in 1899, of the summer school expedition in the West to obtain specimens of the lithophysæ and rhyolite glass, of hot spring deposits, of tufa from the shores of Lake Bonneville at the northern end of Oquirrh Mountains, and of granite from the summit of Pike's Peak, Colorado. A geological formation table has been printed by hand on a roller curtain, on the basis of the divisions in use by the U. S. Geological Survey, with the addition of such foreign formations as are referred to in the instruction given in Courses 8 and 16. It is planned to extend the use of such diagrams by means of frames, to which the diagrams can be attached as in ordinary window-curtain fixtures. These frames and diagrams are readily transferred and stored, and therefore serve the needs of the laboratory and the geological lecture room. A set of photographic enlargements has been made of De Lapparent's charts of the distribution of land and sea during the principal geological epochs.

Mr. Woodman, assistant in the Geological Laboratory, worked during the winter upon a report of Nova Scotia geology. He also conducted, under Professor Shaler's direction, the elementary Summer Course in Geology in Cambridge in both of the past two years. In the summer of 1899 an advanced field course in geology was conducted by Professor Shaler and Mr. J. B. Woodworth in the Rocky Mountains, chiefly in the Yellowstone Park district. This course was attended by thirteen students, all members of the University. In the summer of 1900 Mr. J. B. Woodworth took charge of the field class at Catskill, N. Y., on the 4th of August, and proceeded to Meriden, Conn., spending the time until the 16th of the month in a study of the geologic structure of the Triassic valley. The previous four weeks of instruction in this course were given by Prof. A. P. Brigham, of Colgate University, to five students. Three students completed the course.

In the summer of 1899, Messrs. Burr, Boynton, and Goodrich, advanced students in the department, under Professor Shaler's

direction, made a petroleum survey of New Brunswick, and a general study of the structure of the province, which has yielded valuable results. In the same summer Mr. Woodman made an investigation of gold deposits in Nova Scotia. Mr. P. S. Smith, under the direction of Professor Smyth, in both 1898-99 and 1899-1900, made a study in field and laboratory of copper deposits in Vermont.

Prof. R. T. Jackson reports that the Palæontological teaching collections are in good condition, and have received substantial additions. During his absence in Europe, in the summer of 1899, he selected a quantity of good material to fill gaps in the collection from the trade establishments of Messrs. F. Krantz and B. Sturtz in Bonn. Dr. Jackson spent considerable time during the years 1898-99 and 1899-1900 in working on the collections of fossil plants in the Botanical Museum, and on the Invertebrate Palæontological collections of the Museum of Comparative Zoölogy. The obligations of the department are due to Mr. H. T. Burr and Mr. T. G. Watson for a collection of most interesting Lower Cambrian fossils from Mill Cove, Weymouth, Mass. This new locality for fossils was discovered by Mr. Burr, and Mr. Watson assumed the expense of opening up the ledge. Obligations are also due to Mr. H. T. Burr for Carboniferous fishes from Nova Scotia, and to Mr. J. B. Woodworth for Portage and other fossils from New York State. A number of photographic diagrams were added to those already in hand for teaching. During the mid-year examinations in 1899-1900, the Palæontological teaching collections and other equipment were moved from the Geological Laboratory into an adjoining room in the Museum. This change was a marked improvement, as it gave this department a separate room, whereas in previous years it had shared a room with several geological courses.

Professor Davis was absent in Europe in 1898-99, and since his return has relinquished the elementary course in Physiography to Dr. Daly, who had conducted it during his absence. Professor Davis retained in 1899-1900 the course on the Physiography of Europe and the advanced course in Physiography, as in former years. The collection of foreign topographical maps has, as heretofore, proved of much value in illustrating the geographical features of Europe, but the increase in the number of students attending the course made the use of map sheets less

convenient than usual. Among the subjects studied in the advanced course was the historical development of the content and method of treatment of Physical Geography, as indicated by text-book and treatises since 1800, from which a valuable suggestion was gained as to the direction of future progress; this work having been in the hands of Mr. H. T. Burr, now instructor in the State Normal School, New Britain, Connecticut. A course in Oceanography was given for the first time, by Dr. Daly, in the spring of 1899, and repeated in 1900. By permission of Mr. Agassiz he was given access to the "Blake," and other collections of marine sediments, for special study.

The summer course in Physical Geography was given in 1899 by Dr. Daly and Mr. Twiss, and in 1900 by Professor Davis with the assistance of Mr. H. T. Burr; in each season it was attended by about forty persons, mostly teachers.

Professor Ward reports that the most important additions to the laboratory materials for use in the courses in Meteorology and Climatology were three large-scale colored charts, enlarged from those prepared by Buchan and published in the volume on "Atmospheric Circulation" of the "Challenger" Expedition. Other additions were a large number of diagrams, enlarged for class use from text-book figures; a number of new mounted and colored maps, illustrating the climates of the United States, for use in Geology 25; a sling psychrometer and a black bulb thermometer *in vacuo*. A collection of laboratory reference-books for use in Geology 25 was begun, and promises to be a great help to the students in that course. It is proposed to add to this collection every year, and, as all these books are gifts from the instructor, neither the Harvard College Library nor the laboratory have been put to any expense in the matter. During the year the bound volumes of the *Annalen der Hydrographie und maritimen Meteorologie*, which are frequently consulted by students in courses of Meteorology, have been transferred from the College Library to the Laboratory Library on deposit. All the pilot charts of the North Atlantic and North Pacific Oceans, published by the U. S. Hydrographic Office, which have considerable use in the laboratory, were bound. The charts can thus be more easily handled, and are less likely to be torn.

In Professor Davis's absence during the year 1898-99, Professor Ward was appointed Chairman of the Department of Geology and Geography.

In the spring of 1900, Messrs. Howe and Boutwell, of the Graduate School, and Richardson (formerly a student at Harvard) passed the Civil Service examination successfully, and were admitted to regular standing as Assistant Geologists in the U. S. Geological Survey. Mr. La Forge of the Graduate School, and Mr. Rock, of the Lawrence Scientific School, worked for the same survey during the summer of 1900. Dr. A. W. Grabau has been appointed to a position in the Rensselaer Polytechnic Institute at Troy, N. Y., and Mr. H. T. Burr in the State Normal School at New Britain, Conn.

The committee, consisting of Messrs. Ward, Woodworth, and Dr. Daly, in charge of the Gardner collection of photographs, report that the collection was augmented during the year 1899-1900 by the addition of 643 photographs and slides. The total number of photographs now catalogued is 4,443. Mr. Woodman was employed for a small portion of his time in cataloguing accessions and in caring for the collection, which is every year becoming a more laborious task. The most notable views added during the year comprise a set of Russian and Finnish slides from negatives taken by Dr. Daly. Many new photographs were purchased in Europe by Professor Davis. Room must soon be had for better storage and care of the photographs, and means are needed to prevent the unnecessary scratching of the large photographs already in the collection. The deterioration from shuffling of the views since the collection has been brought together is noticeable and threatening.

Professor Davis travelled in Europe during 1898-99, and made an excursion to the Grand Canyon district of Arizona in June, 1900. Mr. J. B. Woodworth has been employed by the U. S. Geological Survey, under Professor Shaler's direction, in Massachusetts, Rhode Island, and Virginia; Dr. Jaggar, under the direction of Messrs. Hague and Emmons, in the Yellowstone Park and in South Dakota, where he was assisted by J. M. Boutwell and P. S. Smith of Harvard, and J. D. Irving of Columbia. In February, 1900, Mr. J. B. Woodworth was appointed Assistant Geologist of the New York State Museum to make investigation of New York glacial deposits. Mr. Woodworth is preparing an elementary text-book of geology, and a bibliography of geological publications (in the United States) for the International Bibliography recently undertaken by the Geological Commission of Belgium. In Sep-

tember, 1899, Dr. Daly made a field study of the general physiography of Nova Scotia and New Brunswick, and spent the summer of 1900 on the northeastern coast of Labrador: reports of both of these expeditions will be published as Bulletins of the Museum.

Publications by Officers and Students of the Departments of Geology and Geography.

BY N. S. SHALER.

Geology of the Cape Cod District. 18th Ann. Rept. Director U. S. Geol. Surv., 1898, pt. 2, 497-593.

Geology of the Richmond Basin, Virginia (with J. B. Woodworth). 19th Ann. Rept. Director U. S. Geological Surv., 1899, pt. 2, 385-519.

Geology of the Narragansett Basin (with J. B. Woodworth and A. F. Foerste). Monograph XXXIII., U. S. G. S.

Outlines of Earth History; a popular study in Physiography, New York, 1898.

The Negro since the Civil War. Popular Sci. Monthly, LVII., 1900, 29-39.

The Future of the Negro in the Southern States. Ibid., 147-156.

The Influence of the Sun upon the Formation of the Earth's Surface. Internat. Monthly, I., 1900, 41-82.

Also reviews in the *Critic*.

BY W. M. DAVIS.

Physical Geography. Boston, Ginn & Co., 1898. 428 pp.

The Triassic Formation of Connecticut. XVIII. Ann. Rept. U. S. Geol. Survey. Pt. II. 1898. 1-192, xx pl.

The Selection of Topographical Maps for Schools. Journ. School Geogr., II. 1898. 340-345.

The Peneplain. Amer. Geol., XXIII. 1899. 207-239. (Translated in *Ann. de Géogr.*, Vol. VIII. 1899.)

The Drainage of Cuestas. Proc. Geol. Assoc. (London), XVI., 1899. 75-93.

The Rational Element in Geography. Nat. Geogr. Mag., X. 1899. 466-473.

The Geographical Cycle. Geogr. Journ. (London), XIV. 1899. 481-504.

Chapters on North America and the United States, in the International Geography, edited by H. R. Mill. London and New York, 1899. 660-678, 710-773.

The Circulation of the Atmosphere. Quart. Journ. Roy. Meteorol. Soc., XXV. 1899. 160-169. (Translated in *Das Wetter*, Bd. VVI. 1899.)

The System of the Winds. *School World* (London), I. 1899. 244-247. *Zeitschr.*, XVI. 1899. 124-125.

Local Illustrations of Distant Lands. 1. A Temporary Sahara. *Journ. School Geogr.*, IV. 1900. 171-175.

Practical Exercises in Geography. *Nat. Geogr. Mag.*, XI. 1900. 62-78.

Glacial Erosion in the Valley of the Ticino. *Appalachia*, IX. 1900. 136-156.

Glacial Erosion in France, Switzerland, and Norway. *Proc. Boston Soc. Nat. Hist.*, XXIX. 1900. 273-322.

The Fresh-water Formations of the Rocky Mountain Region. *Proc. Amer. Acad. Arts and Sci.*, XXXV. 1900. 345-373.

Continental Deposits of the Rocky Mountain Region. *Bull. Geol. Soc. Amer.*, XI. 1900. 596-601.

A Fault Scarp in the Lepini Mountains, Italy. *Bull. Geol. Soc. Amer.*, XI. 1900. 207-216. (Abstract translated in *Bull. Soc. Geogr. Ital.*, XII. 1899.)

The Physical Geography of the Lands. *Pop. Sci. Monthly*, LVII. 1900. 157-170.

Also reviews in *Journ. Geol., Science*, etc.

BY R. DE C. WARD.

Einige Wolkenbeobachtungen zu Arequipa, Peru. *Meteorologische Zeitschrift*, Band XV. Juli, 1898. pp. 278-279.

Climatic Notes made during a Voyage around South America. *Journ. School Geogr.* Vol. II. September, 1898. pp. 241-248. October, 1898. pp. 297-311.

Resultate Meteorologischer Beobachtungen in Ecuador. *Meteorologische Zeitschrift*, Band XV. September, 1898. pp. 357-358.

The Equipment of a Meteorological Laboratory. *Journ. School Geogr.*, Vol. III., No. 7. September, 1899. pp. 241-250.

Practical Exercises in Elementary Meteorology. 8vo. Ginn and Co., Boston, Mass., 1899. pp. 199. Figs. 53.

The Climate of the Philippine Islands. *Journ. School Geogr.*, Vol. III., December, 1899, 361-368. Reprinted in German, *Das Wetter*, Vol. XVII., Jan., 1900, 15-18.

The Relative Humidity of our Houses in Winter. *Boston Med. and Surg. Journ.*, Vol. CXLII. March 1, 1900. 217-219.

Also reviews in *Bull. Am. Geogr. Soc.*, *Science*, etc.

BY J. B. WOODWORTH.

The Ice-Contact in the Classification of Glacial Deposits. *Am. Geol.*, XXIII. 1899. 80-86.

Some Glacial Wash-plains of Southern New England. *Bull. of the Essex Institute*, XXIX. (1897). 1899.

Vertebrate Footprints on Carboniferous Shales of Plainville, Mass. Bull. Geol. Soc. Am., Vol. XI. 1900. pp. 449-454.

Glacial Origin of the Older Pleistocene in Gay Head Cliffs, with note on Fossil horse of that section. Bull. Geol. Soc. Am., XI. 1900. pp. 455-460.

(With G. C. Curtis) Nantucket: A Morainal Island. Journ. Geol., Chicago, Vol. VII. 1899. 230-236.

Also reviews in *Science*. See also under N. S. SHALER.

By R. C. DALY.

On the Optical Characters of the Vertical Zone of Amphiboles and Pyroxenes; and on a New Method of Determining the Extinction Angles of these Minerals by means of Cleavage Pieces. With 3 plates. Proceedings of the American Academy of Arts and Sciences, Vol. XXXIV., No. 12. February, 1899. pp. 311-323. XXII. 1899. (Translated in Bull. Soc. Franc. Mineral., XXII. 1899.)

A Comparative Study of Etch-figures. The Amphiboles and Pyroxenes. Proceedings of the American Academy of Arts and Sciences, Vol. XXXIV., No. 15. March, 1899. pp. 373-429. (Translated in Bull. Soc. Franc. Mineral., XXII. 1899.)

On a New Variety of Hornblende. Proceedings of the American Academy of Arts and Sciences, Vol. XXXIV., No. 16. March, 1899. pp. 433-437.

Three Days in the Caucasus. Acta Victoriana. Toronto, May, 1899. pp. 481-493.

Palestine as Illustrating Geological and Geographical Controls. Bull. Amer. Geogr. Soc., Vol. XXXI., 1899, pp. 444-458, and Vol. XXXII., 1900, pp. 22-31.

The Russo-Siberian Plain. Acta Victoriana. Toronto, 1899. Reprinted in the Journal of School Geography, Vol. IV. 1900. pp. 81-90.

The Calcareous Concretions of Kettle Point, Lambton County, Ontario. Journ. Geol., Vol. VIII. 1900. pp. 135-150.

Also reviews in *American Naturalist*, *Journ. Geol.*, and *Science*.

By T. A. JAGGAR, JR.

Death Gulch, a Natural Bear-Trap. Appleton's Popular Science Monthly. February, 1899.

Experimental Investigation of the Formation of Minerals in an Igneous Magna: a review. Journ. Geol., Vol. VII., No. 3. April-May, 1899. pp. 300-313. 2 plates.

The Laccoliths of the Black Hills, by T. A. Jaggar, Jr., with a chapter on Experiments Illustrating Intrusion and Erosion, by Ernest Howe. XXI. Ann. Rept. Director U. S. Geol. Survey.

With Arnold Hague and J. P. Iddings: Absaroka Folio, Wyoming (Crandall and Ishawooa Quadrangles). Geologic Atlas of the United States. U. S. Geological Survey, Folio No. 52. 1899.

Also reviews in *American Naturalist*, *Literary World*, *Nation*, and *Science*.

BY J. E. WOODMAN.

Guide in Localities Illustrating the Geology, etc., of the Vicinity of Boston. A. A. A. S., 50th Meeting. Boston, 1898.

The Vettern Escarpments of Southern Sweden. *Science*, U. S. Vol. VIII. pp. 735-736. 1898.

Ore-Bearing Schists of Middle and Northern Cape Breton. Rept. Dept. Mines, Nova Scotia, for year ending Sept. 30, 1898. Halifax, 1899.

Studies in the Gold-Bearing Slates of Nova Scotia. Proc. Bost. Soc. Nat. Hist., XVIII. pp. 375-407. 3 plates. 1899.

Shore Development in the Bras d'Or Lakes. Amer. Geol., XXIV. pp. 329-342. Pl. 1. 1899.

BY J. M. BOUTWELL.

Bibliography of Geographical Works published in the United States in 1898. Bull. Amer. Geogr. Soc., Vol. XXXI. 1899. No. 3.

BY H. T. BURR and R. E. BURKE.

The Occurrence of Fossils in the Roxbury Conglomerate. Proc. Bost. Soc. Nat. Hist., Vol. XXIX. No. 9. 1900. pp. 179-184. 1 pl.

BY H. T. BURR.

A Drainage Peculiarity in Androscoggin County, Maine. American Geologist, XXIV. 1899. pp. 369-371.

A New Lower Cambrian Fauna from Eastern Massachusetts. American Geologist, XXV. Jan. 1900. pp. 41-50. (2 figures.)

BY A. W. GRABAU.

Lake Bouvé, an Extinct Lake in the Boston Basin. Occasional Papers. Bost. Soc. Nat. Hist., Vol. IV. Part III. 1900. pp. 564-600. Pl. 30.

Palæontology of the Cambrian Terranes of the Boston Basin. Occasional Papers. Bost. Soc. Nat. Hist., Vol. IV. Part III. 1900. pp. 601-694. Pls. 31-39.

REPORT ON THE MAMMALS AND BIRDS.

BY WILLIAM BREWSTER.

MAMMALS. — Three large mounted mammals have been purchased for the exhibition collections, — an Eland (*Oreos canna*) from West Africa, a Yak (*Bos grunniens*) from Northern Ladak, — both supplied by Rowland Ward of London, — and a European Brown Bear (*Ursus arctos*). The unidentified skin of a Cat, lacking data, has been received from the Peabody Museum.

BIRDS. — From the Bigelow family of Boston, through Mr. Henry Bryant Bigelow, the Museum received last autumn, nominally on deposit, but with the assurance that they are not likely to be removed from their present quarters, upwards of eight thousand skins of North American and West Indian birds. Of these about six hundred — the original nucleus of the collection — are of especial interest and value from the fact that they were collected and prepared by the late Dr. Henry Bryant, the others having been obtained later by Dr. William S. Bryant and his nephew, Mr. Bigelow. Most of the specimens are in excellent condition, and all come to us safely and permanently stored in insect-proof cans, while Mr. Bigelow has kindly undertaken to have the skins arranged, catalogued, and relabelled at his own expense. We are further indebted to him for the gift of several hundred eggs, chiefly of North American birds, and possessing peculiar interest and value from the fact that they were collected by his grandfather, Dr. Henry Bryant.

The Museum has also acquired by gift, from Mr. J. F. McClure, one hundred and twenty-seven skins collected in Arizona by the donor; from the Peabody Museum of Archæology and Ethnology eleven skins taken by Gorgonio Lopy in 1891 or 1892 near Copan, Honduras; from Mr. F. B. Bell, a mounted Burgomaster Gull (*Larus glaucus*), taken at Northumberland Island, North Greenland, in August, 1898, and a Marsh Hawk (*Circus hudsonius*),

also mounted, obtained at Southampton, Long Island, in September, 1897; from Mr. Walter Faxon, skins of three Lincoln's Sparrows (*Melospiza lincolni*), one White-crowned Sparrow (*Zonotrichia leucophrys*), and two Palm Warblers (*Dendroica palmarum*), collected by Mr. Faxon at Lanesboro', Berkshire County, Massachusetts, in the autumn of 1898; from Mr. Minot Davis, two skins of the Lesser Redpoll (*Acanthis linaria*), taken in Minnesota; from Miss Bertha T. Parker, a nest of the Canadian Warbler (*Wilsonia canadensis*), taken at Bethlehem, New Hampshire, June 28, 1900.

Two young African Ostriches (*Struthio camelus*), both mounted, have been purchased from the Saratoga Branch of the "Florida Ostrich Farm."

An exchange has been made with the Brown and Nichols School of Cambridge for fifteen skins of North American birds collected by Mr. R. L. Agassiz, and several specimens of mammals and birds have been loaned to specialists for purposes of critical study and comparison.

In the last Museum Report I took occasion to mention what seemed to me to be a pressing need of the Museum; namely, that of the acquisition of a collection of mammal skins suitable for purposes of scientific study and comparison. The matter has since received earnest attention on the part of the members of the Overseers Committee, through whose efforts the collection has been secured for the Museum.

I have published during the year:—

In the "Auk":—

Notes on the American Golden-eyed Duck, or Whistler (*Clangula clangula americana*).

In "Bird Lore":—

A Study of a Lincoln's Sparrow.

REPORT ON THE FISHES AND REPTILES.

BY SAMUEL GARMAN.

THE work on these departments has been done with the purpose of keeping them up to modern requirements, and of utilizing to the advantage of the institution, as far as possible, uncompleted labors of other years. Various collections have been identified and catalogued, and numerous changes have been made in the exhibition series and in the storage material. Additions of considerable amount and value have been received from Charles C. Adams, Harry A. Allard, Outram Bangs, Miss I. Batchelder, William Brewster, A. N. Cheney, Dr. R. A. Daly, A. H. Edgerley, George E. Hart, C. P. Jaynes, Dr. W. C. Kendall, Dr. Harris Kennedy, F. Schuyler Mathews, Dr. A. G. Mayer, Prof. C. J. Maynard, Prof. G. H. Parker, Lieut. Wirt Robinson, U. S. A., Rev. Robert K. Smith, Dr. W. M. Woodworth, and others. Everything received has arrived in excellent condition. Besides material furnished for the use of students, shipments have been made to Prof. R. von Lendenfeld, Dr. L. Kathariner, and Dr. W. C. Kendall, in furtherance of researches undertaken by them.

The publications from these departments include the "Deep Sea Fishes" of the "Albatross" Expedition, Volume XXIV. of the Memoirs of the Museum (Number XXVI. of the series of Reports on the "Albatross" Expedition of 1890-91), also reviews, book notices, etc.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

BY SAMUEL HENSHAW.

FOR acceptable additions to the collections acknowledgments are due to Miss Harriet Biddle, Miss Nora Newberry, Miss B. T. Parker, Miss C. G. Soule, and to Messrs. Outram Bangs, W. S. Bigelow, Frederick Blanchard, R. S. Breed, T. D. A. Cockerell, C. B. Davenport, K. C. Davis, J. H. Emerton, W. G. Farlow, W. L. W. Field, F. H. Foster, P. P. Gregson, Roland Hayward, J. G. Jack, C. L. Jackson, T. A. Jaggar, Jr., C. W. Jenks, N. T. Kidder, G. B. King, Carl Ladd, Henry Lorentzen, E. L. Mark, A. G. Mayer, A. P. Morse, J. G. Needham, A. S. Packard, G. H. Parker, F. H. Peabody, Wirt Robinson, H. E. Summers, L. W. Swett, Roland Thaxter, W. L. Tower, A. E. Verrill, E. R. Warren, E. B. Williamson, C. C. Willoughby, W. McM. Woodworth, and to the "Albatross" Tropical Pacific Expedition.

The F. H. Sprague collection, received during the year, fills an important gap. It is rich in New England Rhopalocera, and contains interesting material in other groups.

The above list shows a larger number of contributors than has been recorded in recent years.

The use of the collections by specialists continues constant and time-consuming.

The condition of the entire collection is satisfactory.

The Syntomidæ, Pericoptidæ, Arctiidæ, and the Tineina of the Lepidoptera Heterocera, and the Cæstridæ of the Diptera have been rearranged.

Some work has also been done in the identification and arrangement of portions of the Carabidæ, Staphylinidæ, Scarabæidæ, and the Rhynchophora of the Coleoptera, and of the Coccidæ of the Hemiptera.

Work on the types has been continued; more than 3,000 have been catalogued during the year.

A catalogue of the Myriopods has been begun.

The considerable collections from Australia and the islands of the Tropical Pacific, brought together by Mr. Agassiz and his assistants in late years, though but assorted in part, show some new and interesting forms, and will also add somewhat to our knowledge of the distribution of species already known.

REPORT ON THE MOLLUSCA AND CRUSTACEA.

BY WALTER FAXON.

ADDITIONS to the collection of Crustacea have been received from T. H. Bognall, Caroline I. Chaney, W. Faxon, W. A. Herdman, A. S. Packard, F. W. Putnam, and (by exchange) from the United States National Museum. Through the kindness of Mr. F. N. Balch, a small collection of Mollusks from Behring's Sea has been secured for the Museum, and Dr. Packard has presented examples of the species of *Neretina* and *Melanopsis* collected by himself in Palestine. A specimen of *Pleurotomaria beyrichi*, a Japanese species hitherto unrepresented in this Museum, has been obtained in exchange for one of the West Indian *Pleurotomarias*. Miss E. B. Bryant has made excellent progress with the vast collection of shells received from R. E. Call in 1898. Mr. A. W. Grabau has revised the whole Museum collection of the genus *Fusus*.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALÆONTOLOGY.

BY CHARLES R. EASTMAN.

THE additions to the collection made since the date of the last Report, although less in quantity than those of preceding years, have been better selected, and are scientifically more valuable. Of paramount importance are the complete skeletons of a gallinaeous bird and a large-sized Alligator gar from the Green River shales of western Wyoming, described in the current volume of the Museum Bulletins. Owing to the extreme rarity of fossil avian and lepidosteid remains in the older Tertiary, and the interest attaching to them, the Museum is highly fortunate in having been able to secure these specimens.

In pursuance of the policy adopted some years ago of devoting the principal resources and energy of the Department to a single class of vertebrates, the attempt has been made to fill gaps in the series of fossil fishes wherever possible, and to select a limited number of choice specimens rather than a quantity of indiscriminately assorted material. The time of the Assistant has, for the same reason, been largely devoted to the preparation and study of Palæozoic representatives of this group; and in addition a systematic review has been made of the Eocene and Miocene fish-faunas of Maryland and adjoining States, the results of which are in course of publication in the Reports of the Maryland State Geological Survey. This work was greatly facilitated by the loan of type-specimens and other valuable material belonging to several of the larger Museums.

Numerous requests have been made for the identification of material during the year, and specialists have consulted the storage series at various times. In particular, the visits of Dr. Anton Fritsch of Prague, and Dr. A. S. Woodward of the British Museum, resulted in material benefit to the collection. It is hoped that

other advantages may be derived from tentative arrangements with some western collectors who have spent the present summer in the field.

Additions to the Collection during the Year.

1899. Four specimens of *Palæospondylus gunni*, Traq., from the Old Red Sandstone of Caithness, Scotland. Purchased.

1899. Teeth of *Diplodus*, *Ptyctodus*, and other Devonian fishes, from near Elmhurst, Illinois (described in Jour. Geol., Vol. VII. No. 5, 1899). Presented by Dr. Stuart Weller, of Chicago University.

1899. Kinnear collection. A number of representative specimens of fossil fishes from the Old Red Sandstone of Scotland, collected by William T. Kinnear, of Forss, by Thurso. Purchased.

1899. Type-specimen of *Gallinuloides wyomingensis*, and a complete example of *Lepidosteus atrox*, 1.65 m. long, from the Green River shales of Wyoming (described in Bull. Mus. Comp. Zoöl., Vol. XXXVI. Nos. 3 and 4, 1900). Purchased.

1899. Casts of Devonian Arthrodirens from Bohemia. Presented by Dr. Anton Fritsch, of Prague.

1899. Jaw-bones, femur, vertebræ, and horn of fossil musk-ox, obtained at a depth of 43 feet below the surface in a fluviatile deposit near Rampart City, Alaska. Collected and presented by George M. Reed, of Waltham, Mass.

Papers published during the Year.

Plastiline, a new Modelling Compound. Science, Vol. IX., p. 211. Feb. 10, 1899.

Jurassic Fishes from Black Hills of South Dakota. Bull. Geol. Soc. Amer., Vol. X., p. 397, pl. 45-48. December, 1899.

On new Bird and Fish-remains from the Eocene of Wyoming. Geol. Mag. [4], Vol. VII., p. 54, pl. 4. February, 1900.

The Devonian "Lamprey," *Palæospondylus Gunni*, Traq. By Bashford Dean [Review of]. Journ. Geol., Vol. VIII., p. 286. May, 1900.

Devonische Fischreste aus der Eifel. By F. v. Huene [Review of]. Amer. Geol., Vol. XXV., p. 391. June, 1900.

Ueber neue devonische Fischreste aus der Eifel. Centralblatt für Mineral. June, 1900. p. 177-178.

Karpinsky's Genus Helicoprion. A Review. Amer. Nat., Vol. XXXIV., p. 579. July, 1900.

Fossil Lepidosteids from the Green River Shales of Wyoming. Bull. Mus. Comp. Zoöl., Vol. XXXVI., No. 3. August, 1900.

REPORT ON INVERTEBRATE PALÆONTOLOGY.

BY ALPHEUS HYATT.

THE revision of genera of Cephalopods for Zittel's Palæontology has been completed, and another similar work, but more completely descriptive, has been begun. In consequence of the great difficulties presented in revising Orthoceratidæ, this has not progressed very rapidly.

Prof. Perrin Smith visited the Museum and consulted our collections during the month of June in preparing a work upon the Triassic Cephalopoda. His collections have enlarged the Triassic fauna in this country fully as much as has Mojsisovic's work in Europe, and he has been kind enough to add a small but choice series of his invaluable materials to our collections.

The department is indebted as heretofore to Dr. R. T. Jackson for voluntary labor in the collection. He has revised the collection of Tertiary Gastropods, arranging parts and improving its condition. He also did considerable work on the collections of Bryozoa and Brachiopoda, and selected material for exhibition.

Mr. A. W. Grabau continued his study of the Tertiary Fusidæ in preparing a thesis on that group. The collection of fossil Insects was transferred to the Entomological Department. A few Brachiopods were turned over to the Zoölogical Department for teaching.

The Museum is indebted to the generosity of Mr. J. Willcox of Philadelphia for a choice collection of Tertiary fossils, mostly Mollusca from the Atlantic coast deposits, from the Isaac Lea collection in the Philadelphia Academy of Sciences.

REPORT ON THE LIBRARY.

BY SAMUEL HENSHAW.

SINCE July 1, 1899, the date of the last Report, 252 volumes, 2,681 parts of volumes, 952 pamphlets, and 29 maps have been received.

This year's accessions added to the numbers reported in 1899 give the library a total of 32,467 volumes and 24,346 pamphlets.

236 volumes have been bound; 210 pamphlets have been separately bound.

The geological serials and the reports of governmental surveys, until now divided between the Museum and Whitney libraries, have been combined. The arrangement of the serials is alphabetic; a dummy with reference to an accessible library represents such serials as are not on the shelves. The arrangement of the reports of the various surveys is geographic and alphabetic.

The combination in a single series of the remaining geological and geographical books is in progress.

A shelf catalogue has been begun.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1899-1900.

Bulletin : —

Vol. XXXII.

- No. 10. Reports on the Results of Dredging by the United States Coast Survey Steamer "Blake." XXXVIII. Étude Monographique des Pleurotomaires Actuels. Par E. L. BOUVIER et H. FISCHER. pp. 56. 4 Plates. September, 1899.

Vol. XXXIV.

- THE GEOLOGY AND PHYSICAL GEOGRAPHY OF JAMAICA: Study of a Type of Antillean Development. By ROBERT T. HILL. With an Appendix on some Cretaceous and Eocene Corals from Jamaica. By T. W. VAUGHAN. pp. 256. 41 Plates. September, 1899.

Vol. XXXV.

- No. 3. Studies from the Newport Marine Laboratory. XLII. Longitudinal Fission in *Metridium Marginatum* Milne-Edwards. By G. H. PARKER. pp. 16. 3 Plates. October, 1899.
- No. 4. Contributions from the Zoölogical Laboratory. XCVIII. Ovogenesis in *Distaplia Occidentalis* Ritter (MS.), with Remarks on Other Species. By FRANK W. BANCROFT. pp. 56. 6 Plates. October, 1899.
- No. 5. Contributions from the Zoölogical Laboratory. XCIX. Observations on Non-sexual Reproduction in *Dero Vaga*. By T. W. GALLOWAY. pp. 28. 5 Plates. October, 1899.
- No. 6. Contributions from the Zoölogical Laboratory. C. The Photomechanical Changes in the Retinal Pigment of *Gammarus*. By G. H. PARKER. pp. 8. 1 Plate. October, 1899.
- No. 7. Contributions from the Zoölogical Laboratory. No. 105. The Structure and Development of the Antennal Glands in *Homarus Americanus* Milne-Edwards. By FREDERICK C. WAITE. pp. 62. 6 Plates. December, 1899.
- No. 8. Contributions from the Zoölogical Laboratory. No. 109. Maturation and Fertilization in Pulmonate Gasteropods. By HENRY R. LINVILLE. pp. 38. 4 Plates. May, 1900.

Vol. XXXVI.

- No. 1. An Atlantic "Palolo," *Staurocephalus gregaricus*. By A. G. MAYER. pp. 14. 3 Plates. June, 1900.
- No. 2. Contributions from the Zoölogical Laboratory. No. 112. Some North American Fresh-Water Rhynchobdellidæ, and their Parasites. By W. E. CASTLE. pp. 50. 8 Plates. August, 1900.
- No. 3. Fossil Lepidosteids from the Green River Shales of Wyoming. By C. R. EASTMAN. pp. 12. 2 Plates. August, 1900.
- No. 4. Characters and Relations of *Gallinuloides*, a Fossil Gallinaceous Bird from the Green River Shales of Wyoming. By F. A. LUCAS. pp. 8. 1 Plate. August, 1900.

Vol. XXXVII.

- No. 1. Descriptions of new and little known Medusæ from the Western Atlantic. By A. G. MAYER. pp. 10. 6 Plates. June, 1900.
- No. 2. Some Medusæ from the Tortugas, Florida. By A. G. MAYER. pp. 72. 44 Plates. July, 1900.

Memoirs :—

Vol. XXIII.

- No. 2. Reports on an Exploration off the West Coasts of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the United States Fish Commission Steamer "Albatross" during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding. XXV. The Ophiuridæ. By C. F. LUTKEN and TH. MORTENSEN. pp. 116. 23 Plates. November, 1899.

Vol. XXIV.

- Reports on an Exploration off the West Coasts of Mexico, Central and South America, and off the Galapagos Islands in charge of Alexander Agassiz, by the United States Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding. XXVI. The Fishes. By S. GARMAN. pp. 431. 98 Plates. December, 1899.

Report :—

- 1898-99. pp. 21. 1 Plate. September, 1899.

[B]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1898.

Sturgis-Hooper Fund	\$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
Henry L. Pierce Fund, for Salary of Curator	100,000.00
	<hr/>
	\$685,737.11

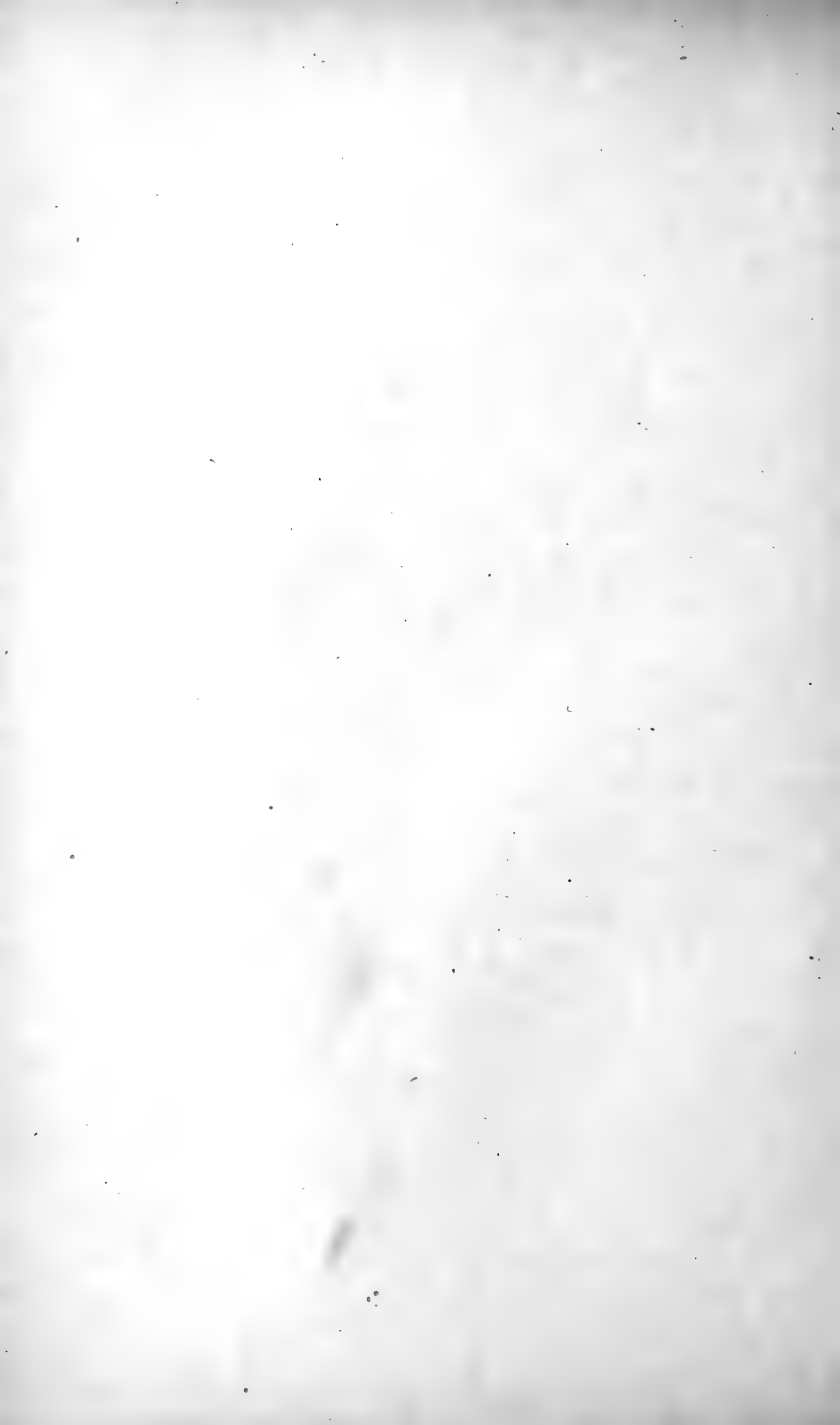
The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts, with vouchers to the payment of which the income is applicable.

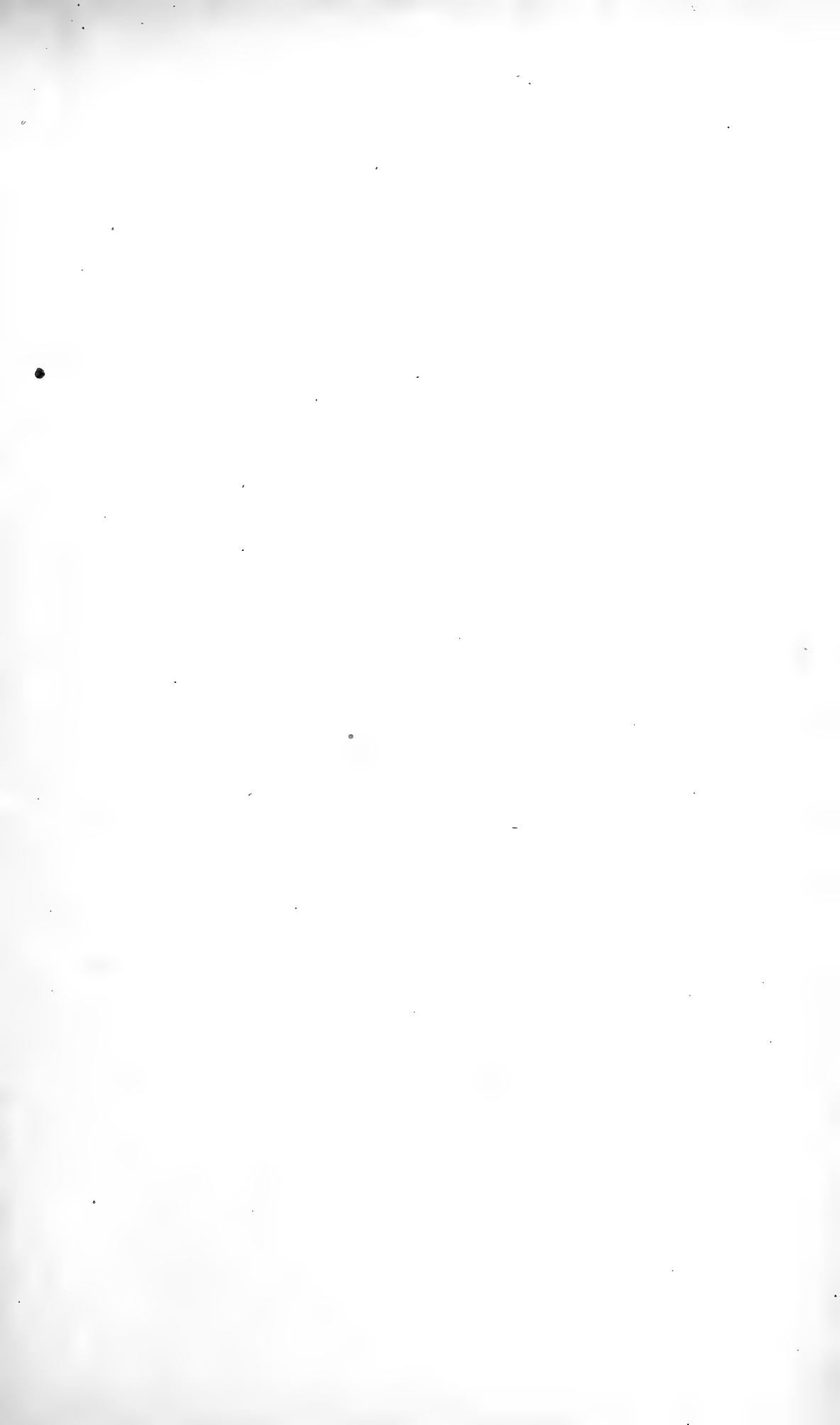
The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of \$250, is assigned annually with the approval of the Faculty of the Museum, at the recommendation of the Professor of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about \$300) can be applied for the benefit of one or more students of Natural History, either at the Museum, the United States Fish Commission Station at Wood's Hole, or elsewhere.

Applications for the tables reserved for advanced students at the Wood's Hole Station should be made to the Faculty of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.







Publications of the Museum in preparation :—

Reports on the Results of Dredging Operations in 1877, 1878, 1879, and 1880, in charge of ALEXANDER AGASSIZ, by the U. S. Coast Survey Steamer "Blake," as follows :—

- E. EHLERS. The Annelids.
- C. HARTLAUB. The Comatulæ, with 15 Plates.
- H. LUDWIG. The Genus *Pentacrinus*.
- A. MILNE EDWARDS and E. L. BOUVIER. The Crustacea.
- A. E. VERRILL. The Alcyonaria.

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of ALEXANDER AGASSIZ, on the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander JEFFERSON F. MOSER, U. S. N., Commanding.

Illustrations of North American MARINE INVERTEBRATES, from Drawings by BURKHARDT, SONNEL, and A. AGASSIZ, prepared under the Direction of L. AGASSIZ.

- LOUIS CABOT. Immature State of the Odonata, Part IV.
- E. L. MARK. Studies on *Lepidosteus*, continued.
 - " On *Arachnaetis*.
- R. T. HILL. On the Geology of the Windward Islands.
- W. McM. WOODWORTH. On the Bololo and Palolo of Fiji and Samoa.
- A. AGASSIZ and A. G. MAYER. The Acalephs of the East Coast of the United States.
- AGASSIZ and WHITMAN. Pelagic Fishes. Part II., with 14 Plates.
- J. C. BRANNER. The Coral Reefs of Brazil.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieutenant Commander Z. L. TANNER, U. S. N., Commanding, in charge of ALEXANDER AGASSIZ, as follows :—

- | | |
|---|---|
| A. AGASSIZ. The Pelagic Fauna. | H. LUDWIG. The Starfishes. |
| " The Echini. | J. P. McMURRICH. The Actinarians. |
| " The Panamic Deep-Sea Fauna. | E. L. MARK. <i>Brachiocerianthus</i> . |
| K. BRANDT. The Sagittæ. | JOHN MURRAY. The Bottom Specimens. |
| " The Thalassicolæ. | P. SCHIEMENZ. Pteropods and Heteropods. |
| C. CHUN. The Siphonophores. | THEO. STUDER. The Alcyonarians. |
| " The Eyes of Deep-Sea Crustacea | M. P. A. TRAÜTSTEDT. The Salpidæ and Doliolidæ. |
| W. H. DALL. The Mollusks. | E. P. VAN DUZEE. The Halobatidæ. |
| H. J. HANSEN. The Cirripeds. | H. B. WARD. The Sipunculids. |
| W. A. HERDMAN. The Ascidians. | H. V. WILSON. The Sponges. |
| S. J. HICKSON. The Antipathids. | W. McM. WOODWORTH. The Nemerteans. |
| W. E. HOYLE. The Cephalopods. | " The Annelids. |
| G. VON KOCH. The Deep-Sea Corals. | |
| C. A. KOFOID. <i>Solenogaster</i> . | |
| R. VON LENDENFELD. The Phosphorescent Organs of Fishes. | |

PUBLICATIONS
OF THE
MUSEUM OF COMPARATIVE ZOOLOGY
AT HARVARD COLLEGE.

There have been published of the BULLETINS Vols. I. to XXXV.; of the MEMOIRS, Vols. I. to XXIV.

Vols. XXXVI., XXXVII., and XXXVIII. of the BULLETIN, and Vols. XXV., XXVI., XXVII. of the MEMOIRS, are now in course of publication.

The BULLETIN and MEMOIRS are devoted to the publication of original work by the Professors and Assistants of the Museum, of investigations carried on by students and others in the different Laboratories of Natural History, and of work by specialists based upon the Museum Collections and Explorations.

The following publications are in preparation:—

Reports on the Results of Dredging Operations from 1877 to 1880, in charge of Alexander Agassiz, by the U. S. Coast Survey Steamer "Blake," Lieut. Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., Commanding.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieut. Commander Z. L. Tanner, U. S. N., Commanding, in charge of Alexander Agassiz.

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding.

Contributions from the Zoölogical Laboratory, Professor E. L. Mark, Director.

Contributions from the Geological Laboratory, in charge of Professor N. S. Shaler.

Subscriptions for the publications of the Museum will be received on the following terms:—

For the BULLETIN, \$4.00 per volume, payable in advance.

For the MEMOIRS, \$8.00 " " "

These publications are issued in numbers at irregular intervals; one volume of the Bulletin (8vo) and half a volume of the Memoirs (4to) usually appear annually. Each number of the Bulletin and of the Memoirs is also sold separately. A price list of the publications of the Museum will be sent on application to the Librarian of the Museum of Comparative Zoölogy, Cambridge, Mass.

